Claims

1. A binder comprising composite polymer particles having a structured form of two or more phases having different physical properties in terms of cell property, adhesive strength and/or coating property, wherein the composite polymer particle comprises:

(a) a polymer based on monomers capable of controlling the cell property; and

either or both of:

(b) a polymer based on monomers capable of controlling the adhesive strength, and

(c) a polymer based on monomers capable of controlling the adhesive strength and the coating property simultaneously.

2. The binder according to claim 1, wherein the composite polymer particle comprises the polymer (a), the polymer (b) and the polymer (c) in turn, starting from the inside of the binder.

3. The binder according to claim 1, wherein the inside polymer is surrounded with the outside polymer and the physical properties of both polymers are different.

4. The binder according to claim 1, wherein the polymer (a) is polymerized from one or more monomers selected from the first group of monomers consisting of styrene-based monomers, ethylene, propylene, conjugated diene-based monomers, nitrile-containing monomers, acrylic esters and a methacrylic esters, among the monomers forming the binder polymer.

5. The binder according to claim 4, wherein the first group of monomers

comprise:

styrene, α-methyl styrene, β-methyl styrene, p-t-butyl styrene; ethylene, propylene; 1,3-butadiene, 2,3-dimethyl-1,3-butadiene, 1,3-pentadiene, p-perylene, isoprene; acrylonitrile, methacrylonitrile; methyl acrylate, ethyl acrylate, propyl acrylate, isopropyl acrylate, n-butyl acrylate, isobutyl acrylate, n-amyl acrylate, isoamyl acrylate, n-hexyl acrylate, 2-ethylhexyl acrylate, hydroxypropyl acrylate, lauryl acrylate; methyl methacrylate, ethyl methacrylate, propyl methacrylate, isopropyl methacrylate, n-butyl methacrylate, isobutyl methacrylate, n-amyl methacrylate, isoamyl methacrylate, n-hexyl methacrylate, 2-ethylhexyl methacrylate, hydroxypropyl methacrylate and lauryl methacrylate.

6. The binder according to claim 1, wherein the polymer (b) is homolymerized or copolymerized from one or more monomers selected from the second monomer group consisting of acrylamide-based monomers, methacrylamide-based monomers, unsaturated monocarboxylic acid-based monomers and unsaturated dicarboxylic acid-based monomers, or is copolymerized from one or more monomers selected from the second monomer group and one or more monomers selected from the first group of monomers as defined in claim 4.

7. The binder according to claim 6, wherein the second group of monomers comprise:

acrylamide, n-methylolacrylamide, n-butoxymethylacrylamide; methacrylamide, n-methylolmethacrylamide, n-butoxymethylmethacrylamide; acrylic acid, methacrylic acid; itaconic acid, maleic acid, fumaric acid, citraconic acid, metaconic acid, glutaconic acid, tetrahydrophthalic acid, crotonic acid, isocrotonic acid and nadic acid.

8. The binder according to claim 1, wherein the polymer (c) is

copolymerized from acrylamide-based monomers, unsaturated monocarboxylic acid-based monomers and unsaturated dicarboxylic acid-based monomers among the monomers forming the binder polymer.

9. The binder according to claim 8, wherein the polymer (c) is copolymerized with one or more additional monomers selected from the first group of monomers as defined in claim 4 and the second group of monomers as defined in claim 6.

10. The binder according to claim 8, wherein the polymer (c) is a copolymer comprising acrylamide, acrylic acid and itaconic acid.

11. The binder according to claim 1, wherein the binder comprises the composite polymer particles formed of four or more phases prepared by polymerizing the polymer (a), polymerizing the polymer (b) and polymerizing the polymer (c), successively, in which each of the steps for polymerizing the polymer (a), (b) and (c) is carried out in two or more times using different monomers.

12. The binder according to claim 1, wherein the composite polymer particles having a structured form of two phases comprises 50 to 90 wt% of the polymer (a) and 10 to 50 wt% of the polymer (b) or polymer (c), the composite polymer particles having a structured form of three phases comprises 10 to 50 wt% of the polymer (a), 10 to 40 wt% of the polymer (b) and 10 to 50 wt% of the polymer (c), and the composite polymer particles having a structure of four or more phases comprises 50 to 90 wt% of the repeated polymerization of polymer (a) and polymer (b) and 10 to 50 wt% of the polymer (c).

13. The binder according to claim 1, wherein the final particle size ranges

from 100 nm to 300 nm.

14. The binder according to claim 1, wherein the glass transition temperature of each of polymer (a), polymer (b) and polymer (c) ranges from -10°C to 30°.

15. The binder according to claim 1, wherein the gel content is 50% or more.

16. A slurry for an electrode of a lithium secondary battery comprising the binder as defined in any one of claims 1 to 15 and active materials.

17. An electrode for a lithium secondary battery obtained by coating the slurry as defined in claim 16 on a collector.

18. A lithium secondary battery comprising the electrode as defined in claim 17.